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H. S. REYNOLDS.

SPUT FOR METALLIC RECEPTACLES.

APPLICATION FILED JAN. 16, 1919.

1,332,686.

Patented Mar. 2, 1920.

Fig. 1

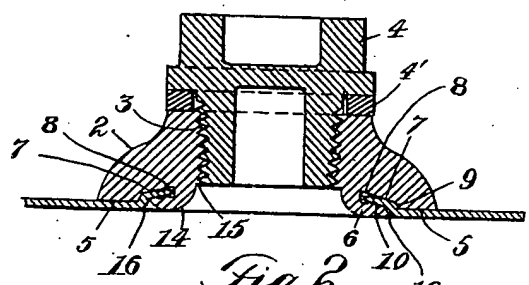


Fig. 2.

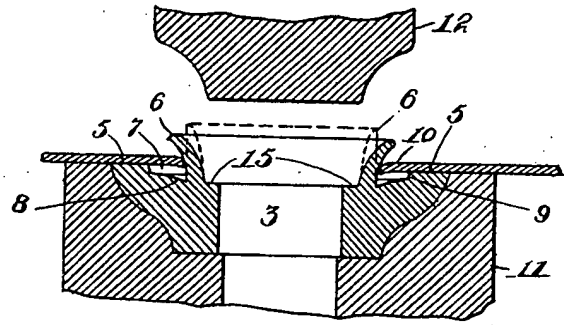


Fig. 3.

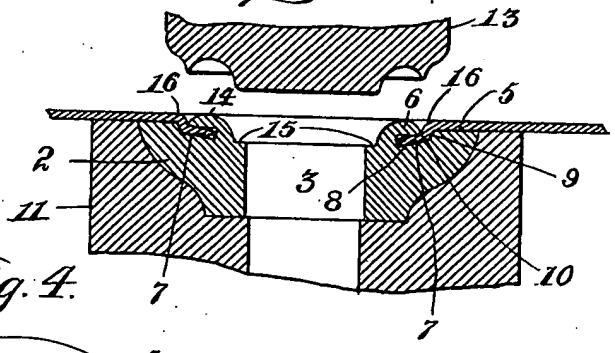
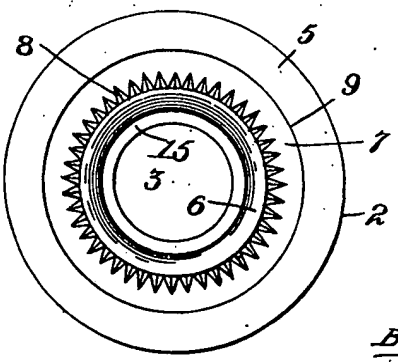


Fig. 4.



Inventor

Henry S. Reynolds

By his Attorney C. P. Reed.

UNITED STATES PATENT OFFICE.

HENRY S. REYNOLDS, OF BROOKLYN, NEW YORK.

SPUT FOR METALLIC RECEPTACLES. REISSUED

1,332,686. Specification of Letters Patent. Patented Mar. 2, 1920.

Application filed January 16, 1919. Serial No. 271,484.

To all whom it may concern:

Be it known that I, HENRY S. REYNOLDS, a citizen of the United States, residing at 261 Eckford street, Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Sputs for Metallic Receptacles, of which the following is a specification.

This invention relates to metallic receptacles, such as casks, barrels and the like having openings in the top or sides thereof for the passage of fluids, and more particularly to an improved sput therefor, whereby the opening in the receptacle may not only be reinforced, but made fluid tight, the object of the invention being to provide an improved sput which may be attached quickly in a simple and inexpensive manner without the necessity of welding it as is usual heretofore.

In the drawings accompanying and forming a part of this specification Figure 1 illustrates a cross section of the present improved sput attached to a part of a metal barrel and the plug therefor, Fig. 2 illustrates the first operation of attaching the sput; and shows a cross section of the die and punch, Fig. 3 illustrates the second and final operation of attaching the sput, and also shows a cross section of the die and punch; and Fig. 4 is a plan view of the top of the sput prior to its attachment.

Similar figures of reference indicate corresponding parts in the several figures of the drawings.

Various attempts have been made to reinforce and provide a fluid tight or leak-proof sput opening for metallic receptacles, particularly metallic barrels, with more or less success, it being the usual practice, however, to weld the sput to the barrel. The result of this mode of procedure has been frequently a leaky joint around the opening of the barrel. The present improvement not only does away with the necessity of this welding operation, while at the same time it reinforces the opening and positively prevents a leaky joint.

This improved sput 2 is provided with central bore 3 suitably threaded for the reception of a plug 4 and its gasket 4'. The sput may be of annular form or have hexagonal or other form of sides and is formed with a lateral or horizontally extending flange 5, and an upright or vertical integral locking flange 6 between which an annular recess 7 is formed having a roughened or serrated portion 8 in its bottom adjacent to the inner edge of such recess.

The recess terminates in a comparatively abrupt shoulder 9 around which the metal edge 10 of the barrel is bent and locked. In attaching this improved sput it is placed in a suitable die 11 with the edge 10 of the barrel opening in juxtaposition to the annular recess 7 of the sput and then by means of a punch 12 the vertical integral locking flange 6 is first forced outward and downward substantially to the position shown in Fig. 2, the punch having the shape shown in said Fig. 2. Then by means of a second punch 13 having the shape shown in Fig. 3 this vertical locking flange is forced further downward over the edge 10 of the barrel opening thereby forcing such edge 10 firmly into the annular recess 7 and bending it around the shoulder 9 of such recess, and also forcing the metal of the edge into engagement with the serrated portion 8 of the recess which prevents any tendency of the sput to turn relative to the head or side of the barrel when a wrench is used to remove or tighten the plug.

The vertical integral locking flange when forced down has its top or outer surface 14 substantially flush with the metal of the barrel, and as this flange is of curved or beaded form it provides a neat and pleasing finish around the barrel opening.

Preferably the flange terminates at its base in a shoulder 15 which facilitates the formation of a bendable locking flange.

Thus, I am enabled by a couple of punching operations, to, as it were, cold weld the metal body edge into the annular recess of the sput and lock the same therein by means of a locking flange forced down upon the metal of the body in such manner that the free edge of the flange will be flush with, or slightly below the shoulder 16 of the barrel metal formed by its bend over the relatively abrupt shoulder 9 of the sput, so that the edge of the barrel opening will have substantially an ogee bend and any possibility of the barrel pulling away from its locking recess and flange prevented, not only by the locking flange but by the shoulder 9. At the same time a fluid tight joint is positively obtained by this simple mode of procedure through the medium of this improved sput, moreover the sput is firmly held against rotatable movement on the ap-

plication of a wrench to the plug or closure either to release or tighten the same.

I claim as my invention:

1. A sput for a metallic receptacle having an annular flange, and an integral vertical bendable locking flange having therebetween an annular recess provided with a shoulder, said sput having means in position to engage the bottom wall of the free edge of the receptacle adjacent to the opening thereof thereby to prevent the rotation of the sput relatively to the receptacle.

2. A sput for a metallic receptacle having an annular flange, and an integral vertical bendable locking flange having therebetween an annular recess, said recess having a serrated bottom portion in position to engage the bottom wall of the free edge of the receptacle adjacent to the opening thereof thereby to prevent the rotation of the sput relatively to the receptacle.

3. A metallic receptacle having an opening, a sput having a laterally extending flange, and an integral bendable locking flange having therebetween an annular recess with the edge of the opening clamped in said recess by said locking flange, said recess also having a shoulder around which the edge of the receptacle is bent, and said sput having means in position to engage the bottom wall of the free edge of the receptacle adjacent to the opening thereof thereby to prevent the rotation of the sput relatively to the receptacle.

4. A metallic receptacle having an opening, a sput having a laterally extending flange, and an integral bendable locking flange having therebetween an annular recess with the edge of the opening clamped in said recess by said locking flange, said recess also having a roughened or serrated portion into engagement with which the bottom face adjacent to the free edge of the receptacle opening is forced.

5. A metallic receptacle having an opening, a sput having a threaded bore, a laterally extending flange, and an integral bendable locking flange having therebetween an annular recess having an abrupt shoulder, said recess having means in position to engage the bottom wall of the free edge of the receptacle adjacent to the opening thereof thereby to prevent the rotation of the sput relatively to the receptacle, the metal of the receptacle being clamped in said recess by bending the locking flange over the edge of such metal.

6. A metallic receptacle having an opening, a sput having a threaded opening, a laterally extending flange, and an integral bendable locking flange having therebetween an annular recess having an abrupt shoulder, said recess having means in position to engage the bottom wall of the free edge of the receptacle adjacent to the opening thereof thereby to prevent the rotation of the sput relatively to the receptacle, the metal of the receptacle being clamped in said recess by bending the locking flange over the edge of such metal and the surface of the locking flange being substantially flush with the surface of the adjacent metal.

7. A receptacle having an annular opening, a sput having an annular recess for the reception of the edge of such opening, and an integral bendable locking flange clamping the metal edge of the receptacle into the recess of said sput, said recess terminating in an abrupt shoulder around which the metal of the receptacle is bent, said sput also having means in position to engage the bottom wall of the free edge of the receptacle adjacent to the opening thereof for preventing the rotation of the sput relatively to the receptacle.

Signed at 1822 Park Row Building, New York city, New York, this 13th day of January 1919.

HENRY S. REYNOLDS.

July 6, 1926. 1,591,183

H. S. REYNOLDS

JOINT BETWEEN RINGS AND SHEET METAL AND ART OF MAKING SAME

Filed March 6, 1922

Fig. 1

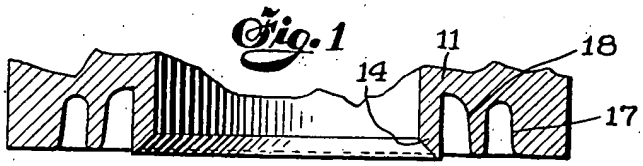


Fig. 2

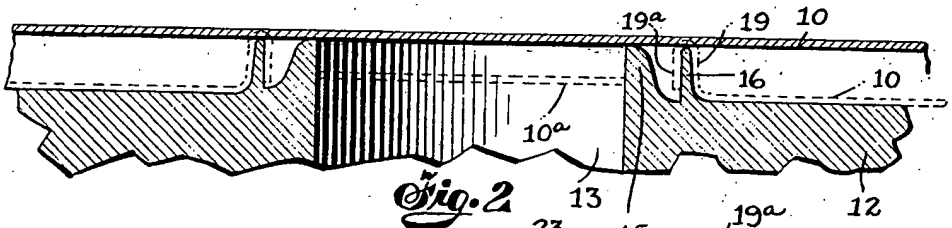


Fig. 3

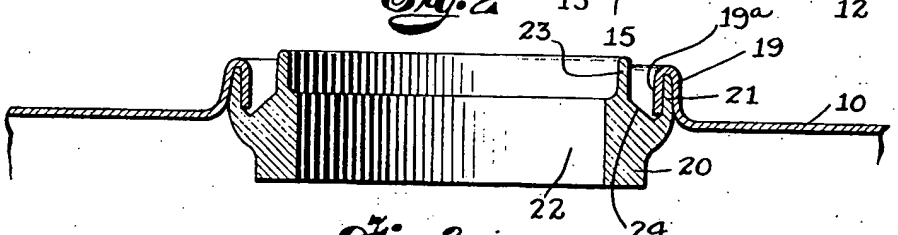
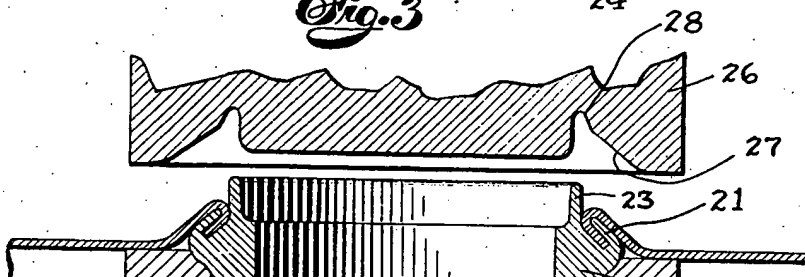
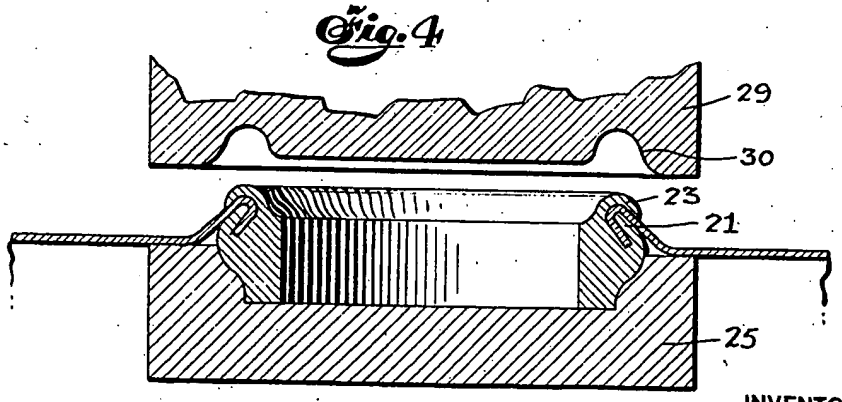


Fig. 4





INVENTOR

Henry S. Reynolds

BY

Emery, Varney, Marx & Hoguet

ATTORNEYS

Patented July 6, 1926. 1,591,183

UNITED STATES PATENT OFFICE.

HENRY S. REYNOLDS, OF BROOKLYN, NEW YORK, ASSIGNOR TO MEURER STEEL BARREL COMPANY, INC., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

JOINT BETWEEN RINGS AND SHEET METAL AND ART OF MAKING SAME.

Application filed March 6, 1922. Serial No. 541,302.

This invention relates to joints between rings and sheet metal and the art of making such joints, and more particularly this invention relates to a joint and the art of making a joint between a sput and the sheet metal of receptacles such as sheet metal barrels for example.

One of the objects of this invention is to provide a simple and practical method of making a durable and rugged connection between a ring member and a sheet metal. Another object is to provide a practical method of making a rigid and fluid-tight connection between the sheet metal of metallic receptacles such as barrels for example and the sput therefor. This invention aims also to provide an art of the above nature that may be readily and inexpensively carried on. Another object is to provide a construction by means of which a durable and rugged connection is made between a ring member and a sheet metal, and also to provide a practical and reliable means for connecting or attaching a sput to the sheet metal of a receptacle or container such as a barrel for example, which connection will be fluid-tight, rigid, and will meet the requirements of practical use.

The invention accordingly consists in the combination of elements, features of construction, arrangement of parts, relation and sequence of steps as will be exemplified in the art and structure to be hereinafter described and the scope of the application of which will be indicated in the following claims.

In the drawings in which is shown an embodiment of this invention,

Figure 1 is a sectional view illustrating the first step or operation on the sheet metal;

Figure 2 is a sectional view showing the ring member positioned with respect to the sheet metal member in readiness for further operations;

Figure 3 is a sectional view illustrating the ring member and sheet metal member after the succeeding stage of operation and illustrating also in section the devices for completing this operation; and

Figure 4 is a sectional view illustrating the final operation upon the ring member and sheet metal member and the devices for completing this operation.

Similar reference characters refer to similar parts throughout the several views of the drawings.

As conducive to a clearer understanding of this invention it may at this point be briefly stated that in attaching or securing ring members to sheet metal members, for example as in securing a sput to the sheet metal of receptacles such as barrels, containers and the like, it is necessary that the joint made therebetween be not only mechanically rigid so as to prevent a relative turning between the parts, but also fluid-tight. Thus where in the case of sheet metal barrels and the like the opening in the ring member or sput provided for the passage of fluids therethrough is closed by means of a threaded plug or the like, the ring member or sput is subjected to relatively large forces or stresses tending to rotate the ring member or sput with respect to the sheet metal when the plug is screwed into position or is removed. This invention aims particularly to provide a simple and practical joint and a method of making the same which will be both mechanically rigid and fluid-tight. Accordingly, the invention will be described in connection with the making of a joint of the above nature between the sput and the sheet metal member of a metallic barrel, container or the like.

Referring now to the drawings, and more particularly to Fig. 1, there is shown at 10 a sheet metal member to which it is desired to secure a ring member or a sput. In Fig. 1 the sheet metal member 10 is shown positioned with respect to a punch member 11 and a die member 12. The die member 12 is provided with a die-hole 13 with which the punch 14 of the punch member 11 is adapted to coact, the parts being preferably circular so that when the punch member 11 and the die member 12 are moved relatively to one another, the punch 14 will enter the die-hole 13 and will punch a circular opening in the sheet metal member 10. Thus at 10^a is shown in dotted lines the blank which the punch 14 stamps out of the sheet metal member 10 to form a circular opening therein.

Arranged concentrically with respect to the wall-forming portion 15 in which the die-hole 13 is formed is a substantially upstanding flange 16 preferably formed integrally with the die member 12 and having its upper edge portions in a plane preferably

slightly below the plane of the upper edge portions of the die-hole 13. Turning now to the punch member 11, it will be noted that extending about the punch 14 therein and substantially concentric therewith is a recess or annular groove 17 adapted to coact with the flange 16 of the die member 12 and dimensioned so that the flange 16 may be received therein and with the sheet metal of the member 10 therebetween. The punch member 11 is furthermore grooved concentrically with the punch 14 as at 18 so that upon the punching operation taking place, the portions 15 of the die member 12 within which the die-hole 13 is formed may be received within the punch member 11 so as to permit the desired relative movement to take place.

The parts of the punch member 11 above described are preferably so proportioned with respect to the die member 12 that the punch 14 is effective, as already above noted, to stamp out the blank 10^a in the sheet metal member 10 to form a circular opening therein. Upon continued relative movement of the punch member and the die member the portions of the sheet metal member 10 adjacent to and surrounding the opening thus punched therein are engaged by the flange 16 on the die member 12 and the remaining portions of the punch member 11; and the flange 16 upon entering the annular groove 17 in the punch member 11 forms the portions of the sheet metal member 10 adjacent the opening into a securing flange 19 preferably substantially hook-shaped and having an overlapping rim-like portion thus bent substantially transversely of the sheet metal member 10 and about the opening, as at 19^a.

Having thus formed the securing flange extending about the periphery of the opening in the sheet metal member 10, a ring member or sput 20 (see Fig. 2) having a substantially upstanding flange 21 extending preferably about its periphery is positioned with respect to the sheet metal member 10 so that the flange 21 is engaged by and substantially within the hook-shaped flange 19 formed as above described. And as will be seen in Figure 2 such inter-egagement of the sheet metal member 10 with the ring member or sput 20 brings the rim-like portion 19^a, which is about the opening in the sheet metal member 10, into the space or groove between the inner wall of the flange 21 and the downwardly and outwardly inclined (see Fig. 2) wall or shoulder 24 of the sput 20. The ring member 20, furthermore, has the usual opening indicated at 22 into which may be secured in any desired manner a plug, for example, for closing the opening where the ring member 20 is desired to be used as a sput in connection with a fluid receptacle or container. The sput 20 has a second flange 23 substantially concentric with the flange 21 and of smaller diameter than the flange 21 so as to be positioned within the latter flange. Intervening the concentric flanges 21 and 23 is a shoulder-forming portion 24 preferably inclined as shown in Fig. 2 and of sufficient extent to accommodate the overlapping portion 19^a of the hook-shaped flange 19 when the latter, together with the outer flange 21, is bent inwardly as will hereinafter be described. Furthermore, the parts of the punch member 11 and the die member 12 above described are preferably so dimensioned with respect to one another that the overlapping portion 19^a formed in the hook-shaped flange 19 of the sheet metal member 10 during the first operation above described is of sufficient extent to be accommodated between the concentric flanges 21 and 23 of the sput 20 when the former flange is bent inwardly.

Having thus preliminarily positioned the sput 20 with respect to the sheet metal member 10 so that the flange 21 is engaged by the securing flange on the sheet metal member 10, the parts so positioned are thereupon placed in a holding die 25 suitably formed to rigidly position the sput 20 with its associated sheet metal member 10 with respect to a punch 26 formed substantially as shown in Fig. 3. The punch 26, it will be noted, is provided with an inwardly sloping operating surface 27 terminating at its innermost parts in a recess 28. Thus when the punch 26 is moved relatively to the holding die 25, the inwardly sloping surface 27 of the punch 26 engages the engaged flanges 19 and 21 (up to now in the position shown in Fig. 2) and upon continued relative movement bends the flanges 19 and 21 inwardly with respect to the ring member and into the position substantially as shown in Fig. 3. During this operation the inner flange 23 of the ring member or sput 20 is housed within the annular groove or recess 28 in the punch 26 and is substantially unaffected by this pressing operation. The action of the punch 26 gives the parts a relation, as above noted, like that shown in Figure 3, from which it will be seen that the rim-like portion 19^a of the sheet metal member 10 has been forced and laid against the downwardly and outwardly inclined wall or shoulder-forming portion 24 and has been made to conform itself substantially to the shape and inclination of the latter, while the flange 21 has been bent inwardly so that the rim-like portion 19^a is securely clamped between the main body portion or the shoulder-forming portion 24 of the sput 20 and the flange 21 itself. During this operation it will be noted that the free edge of the hook-shaped securing flange 19, that is, the lower edge of the rim-like portion 19^a, is entirely bottomed against the base of the outer flange 21 and that the outer edge por-

tion of the flange 21 securely pinches the securing flange between itself and the base of the inner flange 23 on the sput 20. The parts are thus not only securely and rigidly interlocked, but the available coacting surfaces of contact are made a maximum so that the frictional holding of the parts in position is likewise a maximum.

With the parts thus formed as is shown in Fig. 3, another punch 29 as shown in Fig. 4 is made operative to coact with the holding die 25. The punch 29 is provided with an annular groove 30, the walls of which are so curved and formed that upon the punch 29 and the holding die 25 being moved toward one another, the inner flange 23 on the sput 20 is forced and bent outwardly with respect to the ring member so as to overlap the inwardly bent and interlocked flanges 19 and 21 of the sheet metal member 10 and the sput 20 respectively. Preferably the flange 23 is of sufficient extent to extend a substantial distance over the inwardly bent flange 21 and it thus not only securely pinches the hook-shaped securing flange 19 between the upper edge portions of the flange 21 and itself, but also securely clamps the securing flange 19 between itself and the inwardly bent flange 21 throughout a material area so as to increase the frictional holding together between the several parts. Furthermore, the flange 23 in being thus made to overlap the inwardly bent or interlocked flanges 19 and 21 adds to the clamping action of the flange 21 and securely locks the inwardly bent flanges in interlocked relation. The rim-like portion 19ª will also be seen to be effectively prevented from partaking of any retrograde movement out of the groove or space between the inclined shoulder or wall 24 and the inner and similarly inclined wall of the flange 21, not only because of the action of the overlapping flange 23, but also (and independently of the flange 23) by reason of the downward and outward inclination of the walls of the groove and the like inclination given the rim 19ª seated and clamped therein.

It may be noted that during the punching operation in which the several engaged flanges are bent, sufficient force may be applied to the punches to cause an actual flowing together of the material of the securing flange 19 on the sheet metal member 10 and the flanges 21 and 23 on the sput 20. The ring member 20 and the sheet metal member 10 are thus not only in rigid mechanical connection effective to prevent a relative turning to take place between the parts and effective also to withstand the conditions of hard, practical use, but also form a connection or joint which is fluid-tight. The several parts are securely clamped together and, particularly where the actual flowing together of the metal takes place where sufficient pressures are employed, the resultant joint is one of great mechanical rigidity and strength.

It will thus be noted that there has been provided in this invention a joint between ring members and sheet metal members and a method of making the same in which the several objects hereinbefore set forth are achieved and in which many advantages are attained. It will be noted that the joint thus formed is of simple construction, is fluid-tight, and, moreover, is well adapted to meet the requirements of practical use; furthermore, it should be noted that the method provided by this invention is of marked simplicity and may be readily and inexpensively carried on.

As many possible embodiments might be made of this invention and as many changes might be made in the embodiment above set forth or in the steps hereinbefore set forth, it is to be understood that all matter hereinbefore described or set forth in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. The herein described art of forming a connection between rings and sheet metal, which consists in forming a metal ring member having in its upper annular surface a downwardly extending annular groove at least one of the walls of which is inclined downwardly and outwardly, forming in a sheet metal member an opening and about said opening a depending rim shaped substantially to enter the open end of said groove, inter-engaging said ring member and said sheet metal member by moving the rim of the latter into the groove of the former, and forcing those portions of the metal of said ring that are opposite the inclined wall of said groove against said rim to clamp the latter against said inclined wall.

2. The herein described art of forming a connection between rings and sheet metal, which consists in forming a metal ring having in its upper annular surface an annular groove the inner wall of which is inclined outwardly toward its base, forming in a sheet metal member an opening and about said opening a depending rim, forcing said rim downwardly edgewise into said groove, and forcing the outer wall of said groove inwardly and downwardly to clamp said rim between the same and said inclined inner wall.

3. The herein described art of forming a connection between rings and sheet metal, which consists in forming a metal ring having in its upper annular surface an annular groove the inner wall of which is inclined outwardly toward its base, forming in a sheet metal member an opening and about said opening a depending rim, inter-engaging said ring member and said sheet metal

member by moving the rim of the latter downwardly edgewise into said groove, forcing the outer wall of said groove inwardly and downwardly to clamp said rim between the same and said inclined inner wall, and forcing the sheet metal surrounding said rim downwardly and inwardly against the outer surface of said inwardly and downwardly forced portion of the ring.

4. The herein described art of forming a connection between rings and sheet metal, which consists in forming a metal ring member having on its upper annular surface a peripheral upstanding flange and interior of said flange an annular surface sloping upwardly and inwardly from adjacent the base thereof, forming in a sheet metal member an opening of smaller diameter than said flange and about said opening a depending rim, and interlocking said ring member and said sheet metal member by first moving said rim downwardly edgewise within said upstanding flange and then forcing said flange and said rim therewith inwardly toward said inclined surface to clamp said rim against said inclined surface.

5. The herein described art of forming a connection between rings and sheet metal, which consists in forming a metal ring having in its upper annular surface an annular groove the inner wall of which is inclined outwardly toward its base, forming in a sheet metal member an opening and about said opening a depending rim, interengaging said ring member and said sheet metal member by moving said rim downwardly edgewise into said groove, forcing the outer wall of said groove inwardly and downwardly to clamp said rim between the same and said inclined inner wall, and then forcing the upper portion of the part of said ring member on the inner side of said groove outwardly over a portion of the sheet metal surrounding said rim.

6. The herein described art of forming a connection between rings and sheet metal, which consists in forming a metal ring member having on its upper annular surface a pair of annular substantially concentric upstanding flanges, forming in a sheet metal member an opening and about said opening a depending rim, placing said rim between said two flanges, bending the outer flange inwardly and downwardly to clamp said rim, and bending the inner flange outwardly and downwardly over a portion of the sheet metal surrounding said clamped rim.

7. The herein described art of forming a connection between rings and sheet metal, which consists in forming a metal ring member having on its upper annular surface a pair of annular substantially concentric upstanding flanges and between said flanges a downwardly and outwardly inclined annular surface, forming in a sheet metal member an opening and about said opening a depending rim, placing said rim between said two flanges, bending the outer flange inwardly and downwardly to clamp said rim against said inclined surface, and bending the inner flange outwardly and downwardly over a portion of the sheet metal surrounding said clamped rim.

8. In a construction of the class described, in combination, a metal ring member having therein an annular groove the walls of which are inclined at an acute angle with respect to the axis of the ring, and a sheet metal member having an opening therein and a rim about said opening shaped substantially to the contour of said groove, resting therein and locked between the walls thereof, the sheet metal about said rim being bent over the portion of said ring exterior of said groove.

9. In a construction of the class described, in combination, a metal ring having therein a downwardly extending annular groove the walls of which are inclined from its mouth downwardly at an angle with respect to the axis of the ring, and a sheet metal member having an opening therein and a rim about said opening shaped substantially to the contour of said groove, resting therein and locked between the walls thereof.

10. In a construction of the class described, in combination, a metal ring having therein a downwardly extending annular groove the walls of which are inclined downwardly and outwardly from its mouth toward its base at an angle with respect to the axis of the ring, and a sheet metal member having an opening therein and a rim about said opening shaped substantially to the contour of said groove, resting therein and locked between the walls thereof.

11. In a construction of the class described, in combination, a metal ring member having in its upper portion an annular downwardly extending groove inclined outwardly toward its base, the outer wall of said groove comprising an annular flange forming the outer portion of said ring exterior of said groove, and a sheet metal member having an opening therein and a downwardly and outwardly inclined rim about said opening and resting in said groove, said flange locking said rim between the walls of said groove.

12. In a construction of the class described, in combination, a metal ring member having in its upper portion an annular downwardly extending groove inclined outwardly toward its base, the outer wall of said groove comprising an annular flange forming the outer portion of said ring exterior of said groove, and a sheet metal member having an opening therein and a downwardly and outwardly inclined rim about said opening, resting in said groove and locked be-

tween the walls thereof, the sheet metal surrounding said rim being bent over the upper end of said flange and downwardly over the outer surface thereof.

13. In a construction of the class described, in combination, a metal ring member, and a sheet metal member having therein an opening and portions about said opening bent out of the plane of said sheet metal and interlocked with the metal of said ring, said portions extending in a direction downwardly and outwardly inclined at an angle with respect to the axis of the ring.

14. In a construction of the class described, in combination, a metal ring member having in its upper portion an annular downwardly extending groove inclined outwardly toward its base, the outer wall of said groove comprising an annular flange forming the outer portion of said ring exterior of said groove, a sheet metal member having an opening therein and a downwardly and outwardly inclined rim about said opening, resting in said groove and locked between the walls thereof, the sheet metal surrounding said flange being bent over the upper end of said outer flange, said ring having portions thereof inside of said groove bent outwardly against said sheet metal member and in a direction substantially transverse of the rim of the latter.

15. In a construction of the class described, in combination, a metal ring member having in its upper portion an annular downwardly extending groove inclined outwardly toward its base, the outer wall of said groove comprising an annular flange forming the outer portion of said ring exterior of said groove, a sheet metal member having an opening therein and a downwardly and outwardly inclined rim about said opening, resting in said groove and locked between the walls thereof, the sheet metal surrounding said rim being bent over the upper end of said flange and downwardly over the outer surface thereof, and the upper portion of said ring inside of said groove being flanged outwardly and downwardly over said last portion of the sheet metal.

In testimony whereof, I have signed my name to this specification this 27th day of February, 1922.

HENRY S. REYNOLDS.

June 8, 1965 P. E. DOUBLE ETAL 3,187,424

METHOD OF APPLYING A FASTENER

Filed May 3. 1961 2 Sheets-Sheet 1

FIG. 1

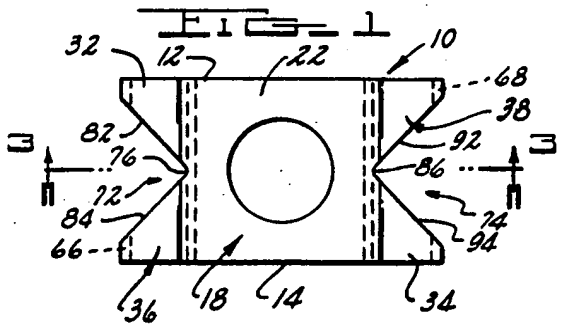


FIG. 2

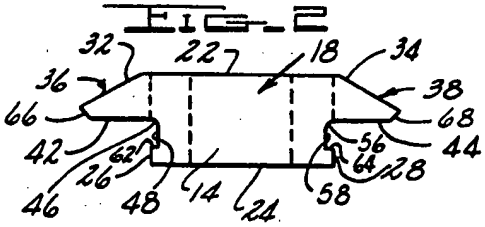


FIG. 3

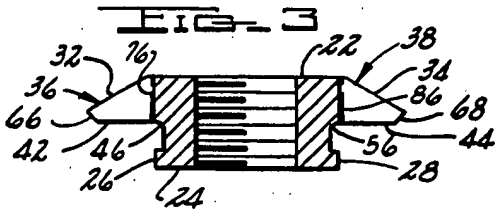


FIG. 6

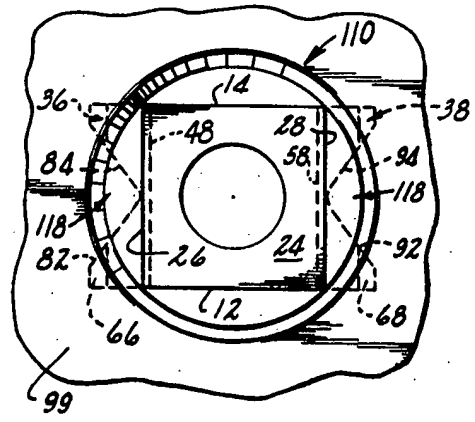


FIG. 4

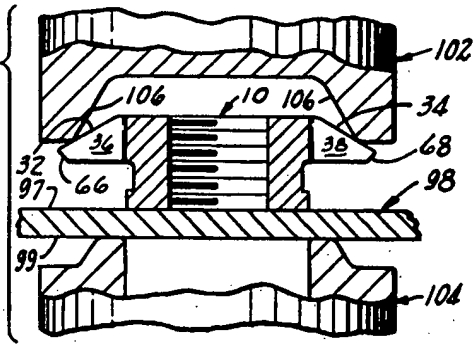


FIG. 5

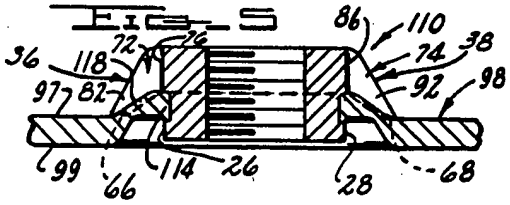
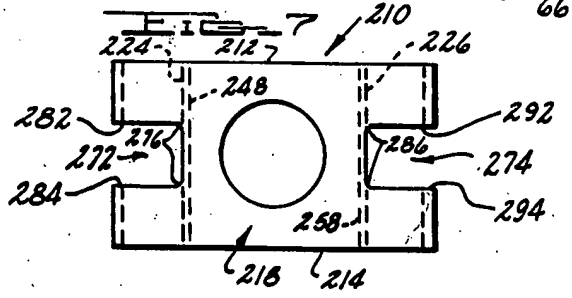


FIG. 7



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June 8, 1965 P. E. DOUBLE ETAL 3,187,424

METHOD OF APPLYING A FASTENER

Filed May 3, 1961

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Fig. 8

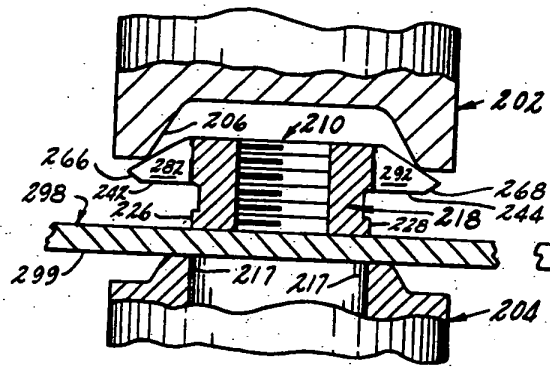


Fig. 11

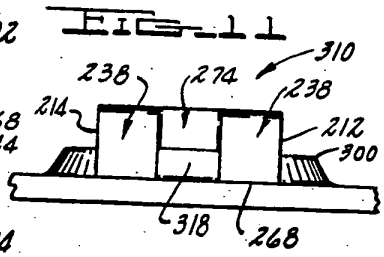


Fig. 9

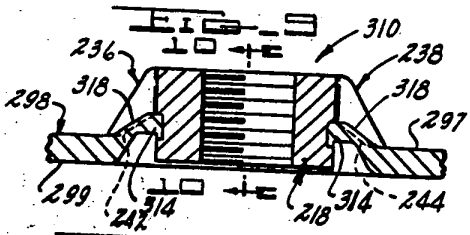


Fig. 10

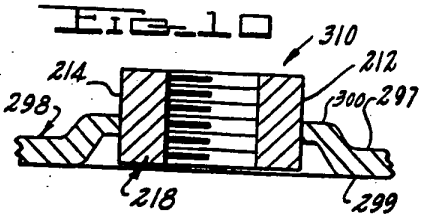


Fig. 12

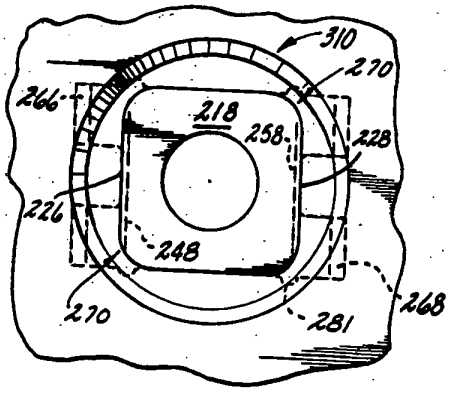
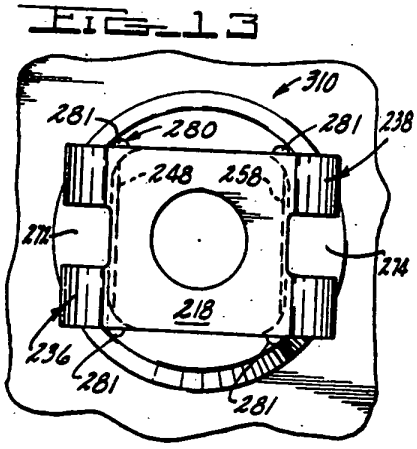


Fig. 13



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United States Patent Office 3,187,424 Patented June 8, 1965

3,187,424

METHOD OF APPLYING A FASTENER

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Filed May 3, 1961, Ser. No. 107,509
2 Claims. (Cl. 29—432)

The present invention relates to new and useful improvements in a method of applying self piercing fasteners.

Various types of self piercing fastener constructions have been developed in an attempt to obtain a more secure bond between the fastener and the panel or part to which it is applied. Most sheet metal products that are manufactured in volume, are produced on high production equipment which involve, in most instances, several stamping operations. With the increased usage of thin (light gage) material, many serious problems have arisen. For the most part, these problems with which manufacturers are confronted can be solved by the use of the self piercing fastener.

While spot or projection welding is the most common method of assembly now in use, many assemblies afford conditions in which welding is entirely unsatisfactory. The inability of known welding methods to maintain a uniform attaching strength due to non-uniform material thickness creates a serious production problem. Heat generated during the welding process causes warpage which is also problem.

The necessity of conveying large and irregular shaped partially completed assemblies to the welding equipment also presents a handling problem, in that the conveying equipment required is foreign to the basic stamping operation. Because of the inherent difficulties which are constantly encountered in the welding operation, whenever and whenever possible, manufacturers have turned to other means of assembly and fastening.

Of the fastening methods currently in use, none have provided the opportunities for economical manufacture and assembly offered by the self piercing fastener method. These advantages will become apparent as the method of applying the self piercing fastener is reviewed.

A primary object of the present invention is the provision of a method of securing a self piercing fastener to a panel at a high rate of speed with existing equipment that is simple, durable and efficient.

Another object of this invention is the provision of a method of applying a rectangular shank fastener wherein the shank portion prevents rotation of the fastener in the panel on which it is secured.

A further object of the instant invention is the provision of a method of applying a self piercing fastener which is installed and embossed in a single step operation.

Another object of this invention is the provision of a method of applying a self piercing fastener which, after application, will have a superior holding quality, while the possibility of distortion and pull through is virtually eliminated.

Another object of this invention is the provision of a method of applying a self piercing fastener wherein the stress concentration in the fastener and panel is held to a minimum.

The above and other objects can be accomplished by the provision of a self piercing fastener having a generally rectangular body shank; substantially flat and parallel faces on said body shank; a pair of laterally extending flanges on two opposite sides of said body shank, the lower surfaces thereof located in generally parallel relationship to the upper and lower surfaces of said body shank, the upper surfaces of each of said flanges depends downwardly from the shank; intermediate the

downwardly divergent upper surfaces of the flanges and the lower surfaces thereof is a second angular surface which extends upwardly; a cut away section on the ends of each of the flanges; an undercut in the sides of said shank below each of said flanges; the lower edges of said shank forming a cutting edge to pierce an opening in a panel member when said fastener is positioned on a panel in a preselected location over a hollow die button beneath a contoured ram, movement of said contourned ram permits engagement of the angular portion of said flanges with the ram, continued movement of said ram moving the shank portion of said fastener through said panel to form an opening therein while simultaneously forming an embossure in said panel and displacing material from said panel into the undercut portions of said fastener, the flange portion being deformed by the contoured ram in a manner to engage the outer surface of said embossure.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

In the drawings:

FIG. 1 is a plan view of a self piercing fastener which embodies the present invention.

FIG. 2 is an elevational view of the self piercing fastener shown in FIG. 1.

FIG. 3 is a cross sectional view taken on lines 3—3 of FIG. 1.

FIG. 4 is a cross sectional view through the apparatus used to apply the fastener to the panel.

FIG. 5 is cross sectional view similiar to FIG. 3 which shows the fastener secured to a panel member.

FIG. 6 is a bottom view of FIG. 5 with the panel broken away.

FIG. 7 is a modified form of the fastener shown in FIG. 1.

FIG. 8 is a cross sectional view taken through a modified form of the apparatus.

FIG. 9 is a cross sectional view through the modified fastener shown in FIG 7 as applied with the modified apparatus.

FIG. 10 is a cross sectional view taken on lines 10—10 of FIG. 9.

FIG. 11 is an end elevational view of the modified fastener secured to a panel member.

FIG. 12 is a bottom view of the fastener assembly shown in FIG. 9.

FIG. 13 is a top view of the fastener assembly shown in FIG. 9.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Referring to the drawings, FIGS. 1 and 2 illustrate a plan and elevational view respectively of the self piercing fastener 10 which embodies the present invention. The fastener 10 is of generally rectangular configuration. The longitudinal sides 12 and 14 of the fastener 10 lie in substantially parallel relationship, as do the upper and lower surfaces 22 and 24 of the shank body portion 18. Extending laterally from the shank body 18 and on two opposed vertical sides 26 and 28 thereof, are flange members 36 and 38. The end sections of the upper surfaces 32 and 34 of the flanges 36 and 38 depend angularly downward and outwardly from the upper generally flat top surface

22 of the shank 18, while the lower surfaces 42 and 44 of the flanges are in substantially parallel relationship thereto. The body shank portion 18 of the fastener 10 is of generally symmetrical configuration and is undercut immediately below surfaces 42 and 44 of the flanges 36 and 38. A first radius 46 is found at the intersection of surface 42 with the vertical surface 48 on the shank 18 and a second radius 56 is found at the intersection of surfaces 44 with vertical surface 58. Both of the undercut surfaces 48 and 58 are generally parallel and located in predetermined spaced relationship to the vertical sides 26 and 28 on the shank 18. Immediately adjacent to the flange surfaces 42 and 44 are located two aligned and generally flat horizontal surfaces 62 and 64. Surface 62 intersects the vertical surfaces 26 and 48 of the shank 18 at right angles and surface 64 intersects the corresponding vertical surfaces 28 and 58 located adjacent thereto. While the undercut portions are described as being generally parallel, they can of course be angularly divergent without departing from the scope of the invention.

Intermediate the angular surfaces 32 and 34 of the flanges 36 and 38 and the under surfaces 42 and 44 thereof, is a generally flat surface 66 on the left and 68 on the right. The intersection of surface 32 with surface 66 defines the right edge of the fastener while the corresponding intersection of surfaces 34 and 68 define the left edge.

Referring to FIG. 1 again, it will be noted that the central portions 72 and 74 of the flanges 36 and 38 are cut away. A third radius 76 is found at the intersection of the adjacent flat surfaces 82 and 84 and a fourth radius 86 is found intermediate the intersection of the corresponding flat surfaces 92 and 94. Radii 76 and 86 are positioned substantially along the longitudinal center line of the fastener and are located perpendicularly to the vertical edges 26 and 28 of the shank 18. The root of each radius is in line with the edge surfaces 26 and 28 of the shank body 18. This relationship is best viewed in FIG. 3 of the drawings.

FIG. 4 of the drawings relates to the method of applying the above described part. The first step in the present method consists of positioning the fastener 10 on a flat panel 98 beneath a contoured ram 102.

The panel 98 is positioned on a hollow die button anvil 104 which has the same general configuration as the shank 18 of the fastener 10. The contoured ram 102 is then moved down to engage the fastener, with the edges of the angular portions 106 of the contoured ram 102 engaging the angular divergent sections 32 and 34 of the fastener. The edges of the shank 18 then act as a punch to pierce an opening in the panel 98. Continued movement of the contoured ram 102 downwardly, deforms the flanges 36 and 38 into contact with the upper surface 97 of the panel 98, while the underside of the panel 99 is deformed and the edges of the opening are displaced to engage the undercut sections, so as to thereby form an embossment within the confines of the extremities of the fastener proper.

The resultant assembly 110 is shown in FIG. 5 of the drawings. The material 114 is displaced from the panel 98 cold flows into the undercut sections, while the material 118 between the cut away end sections 72 and 74 flows in a manner as to engage the surfaces 82, 84, 92 and 94 thereof respectively. The flat sections 66 and 68 intermediate surfaces 32 and 42 and 34 and 44 are moved into engagement with the upper surface 97 of the panel 98 when the flanges 36 and 38 are deformed.

The configuration of the underside of the finished assembly 110 is shown in FIG. 6 of the drawings. From this drawing, it will be appreciated that the finished assembly is simple, durable and inexpensive and that the formation of the embossment within the confines of the extremities of the fastener proper will result in a product wherein deformation of the panel, as a result of high loading will be substantially reduced. When the fastener of the present invention is applied in the manner taught, no crushing or undesirable distortion of the fastener occurs as has been encountered in the past.

The fastener 210 shown in FIG. 7 of the drawings is generally the same as that shown in FIG. 1, with the ends 272 and 274 cut away in parallel relationship to the longitudinal side. The depth of the cut away sections 272 and 274 is of such dimension as to be in alignment with the vertical surfaces 224 and 226 of the shank 218. The edges 282, 284, 292 and 294 of the cut away sections are in alignment with each other, and are located in generally parallel relationship with the longitudinal sides 212 and 214. The undercut 248 and 258 are formed in the same manner previously described. The radii 276 and 286 are likewise between the cut away portions 272 and 274 of flanges 236 and 238.

FIG. 8 of the drawing illustrates the modified fastener 210, as applied with the use of slightly modified tooling. The operation is generally the same as that previously described, with the one exception that the die button 204 is of slightly different configuration than the configuration of the shank 218. The corners 217 thereof have a radius therein. As the ram 202 is moved downwardly, the shank 218, acting as a punch, is moved through the panel 298. Continued movement of the contoured ram 202, permits the die button 204 to cut away the four corners of the shank 218 and displaces the material cut therefrom, into the panel member 298 to form a densified area 270 adjacent thereto. In addition, the material displaced from the fastener 210 manifests itself on the opposite side 297 of the panel 298 in the form of tabs 280. One tab 281 is formed at each corner thereof, and provides a structural reinforcement, at the point of highest stress concentration.

The finished fastener assembly 310 is illustrated in the remaining FIGS. 9–13 of the drawings. FIG. 9 shows a cross section taken along the longitudinal center line of the finished product. The panel material 314 is flowed into the undercut sections as well as between the cut away ends 272 and 274 as shown at 318. The cross sectional configuration of the embossment 300 is shown in FIG. 10 and was taken at substantially right angles to the cross section shown in FIG. 9. It will be noted that the material flows in the same manner of occurrence as in FIG. 9. No undercut is formed along the longitudinal edges 212 and 214 of the fastener.

FIG. 11 shows the end elevation of the fastener assembly 310 as applied to a panel 298 while FIGS. 12 and 13 show the underside and top respectively of a finished assembly. The configuration of the opening in die button 204 is the same as the configuration of the shank 218. The densified portion 270 adjacent to each of the cut away corners is substantially stronger than the first structure described and the finished product more equally distributes the stress loads throughout the panel and part.

The above described structure is an advance in the art. Distortion of the panel as a result of loading is minimized and the load capacity of the fastener is substantially increased. In addition, the load is more uniformly distributed. The radii in the cut away sections of the flanges, as well as in the undercut sections of the fastener reduces the possibility of fracture within the parts as a result of deformation during application and usage. The resulting fastener assembly is inexpensive, lighter in weight and more durable than fasteners which are now available.

Having thus described our invention, we claim:

1. In a method of securing a threaded fastener to a panel, the panel being interposed between said fastener and a die button, said threaded fastener having a rectangular piercing face joined by a shank to oppositely directed flanges having stop surfaces substantially normal to the longitudinal axis of said fastener, said shank having grooves immediately adjacent the flanges, said grooves being interposed between the stop surfaces and the pierc-

ing face of said fastener, said die button having an aperture corersponding substantially to the shape of said piercing face and an embossing portion circumscribing said aperture, the steps performed in a single uninterrupted motion of the fastener relative to the panel of (1) piercing said fastener piercing face through said panel and into said die button aperture to form an opening in said panel, (2) swaging into said grooves a portion of said panel member adjacent said opening and confined between said die button and said flanges, and (3) deforming the stop flanges toward said piercing face and into extended surface engagement with the adjacent surface of said panel, thereby deforming the panel portions outwardly of said die button embossing portion in the direction of nut movement relative to the panel so that that portion of the panel immediately surrounding said aperture therein is embossed.

2. In a method of securing to a panel member a threaded fastener having a rectangular piercing face joined by a shank to oppositely directed flanges having stop surfaces substantially normal to the longitudinal axis of the fastener, said shank having grooves immediately adjacent the flanges and interposed between said stop surfaces and said piercing face, the steps of interposing the panel between said fastener and a die button having an aperture substantially corresponding to the shape of said piercing face and displacing the fastener in a single

uninterrupted motion relative to the panel, (1) to pierce said fastener piercing face through said panel and into the die button aperture to form an opening in said panel, (2) to swage into said grooves a portion of said panel member adjacent said opening and confined between said die button and said flanges, and (3) to deform the stop flanges and those portions of the panel in contact therewith toward said piercing face and into extended surface engagement with the adjacent surface of said panel while (4) supporting on said die button against such deformation those portions of the panel and those portions of said flanges immediately adjacent the die button aperture, so that the deformation of the stop flanges also embosses the panel.

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CARL W. TOMLIN, *Examiner.*

978,604

PATENT SPECIFICATION

DRAWINGS ATTACHED

978,604

Date of filing Complete Specification: Sept. 20, 1963.

Application Date: June 26, 1962. *No. 24500/62.*

Complete Specification Published: Dec. 23, 1964.

Index at acceptance:—F2 H(12B3, 17A3)

International Classification:—F 06 b

COMPLETE SPECIFICATION

Clinch Nuts

I, RONALD ERNEST HAYDEN, a British Subject of Ridgeway, 21, Ernest Road, Emerson Park, Hornchurch, Essex, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to clinch nuts, sometimes referred to as rivet bushes, and of the kind having a boss with a tubular shank extending from one end face, the shank being intended to be passed through an aperture in a panel or other article and clinched over the rear face thereof to anchor the nut in position so that a bolt or screw can be threaded into the nut.

It is an object of the invention to provide an improved clinch nut which will in addition securely grip or lock onto the bolt or screw.

According to the present invention an internally screwthreaded clinch nut comprises a boss having an unthreaded tubular shank extending coaxially from one end face, the shank being intended to be passed through and clinched over the rear face of a panel or other apertured article, and having a second tubular shank extending coaxially from the other end face of the nut, the second tubular shank being formed with an internally threaded bore which is a continuation of that of the boss, the external diameters of both shanks being less than that of the boss, and the second tubular shank being formed with an external circumferential groove producing an annular neck portion of reduced radial wall thickness adjacent to the end face of the boss, such that the wall of this shank can be deformed radially inwardly to provide an increased frictional grip on a screw or bolt threaded through the bore of the clinch nut.

The second tubular shank may be formed with a number of radial slots in its wall, the slots extending axially inwardly from the free end of the shank substantially to the end face of the boss and splitting the shank into a number of segments.

Thus the second tubular shank can be gripped by means of a pair of pliers or a crimping tool and squeezed radially inwardly to cause it to grip more tightly onto the screwthread of a bolt or screw threaded through the clinch nut so as to secure the bolt or screw frictionally in the clinch nut.

The boss and/or the first mentioned tubular shank may be provided with serrations designed to engage with the opposed surface of the apertured article to which the clinch nut is secured, to prevent the nut turning therein.

The invention may be carried into practice in various ways, but one specific embodiment and certain modifications thereof with now be described with reference to the accompanying drawings, in which:

Figure 1 is a side view of a clinch nut, and Figure 2 is an end view of the radially slotted end of the nut shown in Figure 1.

In the illustrated embodiment of the invention a clinch nut 10 comprises a central generally cylindrical boss 11, having a thin-walled tubular shank or sleeve 12 projecting axially from one end face 13 of the boss, the shank 12 being designed to be passed through and clinched over the rear face of a metal panel to which the nut 10 is to be anchored. The shank 12 is tapered in cross section towards its sharp-edged free end 14 and its external and internal diameters lie between the inner and outer diameters of the boss.

The annular end face 13 of the boss is formed with a series of radial serrations 15, designed to engage and grip the corresponding surface of the panel. Alternatively or in addition the external tapered surface of the shank 12 may be formed with serrations, longitudinal or spiral, for the same purpose.

From the opposite end face 16 of the boss 11 extends a second tubular shank 17, whose internal diameter is the same as that of the

boss, both parts being formed with a common internal screw-thread 18. The external diameter of this second shank 17 is considerably less than that of the central boss 11, and at its end adjacent to the boss 11 is formed with an external groove 19 producing a reduced diameter portion constituting a neck 20. The whole of the shank 17 is divided into four segments 17A, 17B, 17C and 17D by four radial slots 21 extending at right angles to one another axially inwards from the free end of the shank 17 through the neck 20 towards the end face 16 of the boss 11. These segments 17A to 17D can be closed inwards to grip the end of the screw.

In a modification of the clinch nut of Figures 1 and 2, the second tubular shank 17 is not formed with any radial slots 21 but the groove 19 is relied on alone to produce a zone of weakness constituted by the neck 20, which allows the tubular shank 17 to be pinched by means of a crimping tool or the like to a required extent to cause it to grip the thread of a screw or bolt threaded through the bore of the clinch nut, so as to lock the clinch nut frictionally to the screw or bolt.

WHAT I CLAIM IS:—

1. An internally screwthreaded clinch nut which comprises a boss having an unthreaded tubular shank extending coaxially from one end face, the shank being intended to be passed through and clinched over the rear face of a panel or other apertured article, and having a second tubular shank extending coaxially from the other end face of the nut, the second tubular shank being formed with an internally threaded bore which is a continuation of that of the boss, the external diameters of both shanks being less than that of the boss, and the second tubular shank being formed with an external circumferential groove producing an annular neck portion of reduced radial wall thickness adjacent to the end face of the boss, such that the wall of this shank can be deformed radially inwardly to provide an increased frictional grip on a screw or bolt threaded through the bore of the clinch nut.

2. A clinch nut as claimed in Claim 1 in which the second tubular shank is formed with a number of radial slots in its wall, the slots extending axially inwardly from the free end of the shank towards the end face of the boss and splitting the shank into a number of segments.

3. A clinch nut as claimed in Claim 1 or Claim 2 in which the boss and/or the first-mentioned tubular shank are or is provided with serrations designed to engage with the opposed surface of the apertured article, to prevent the nut turning therein.

4. A clinch nut as claimed in Claim 1 or Claim 2, in which the unthreaded tubular shank has an external conically tapered surface.

5. A clinch nut substantially as specifically described herein with reference to the accompanying drawings.

KILBURN & STRODE,
Chartered Patent Agents,
Agents for the Applicant.

Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press (Leamington) Ltd.—1964. Published by The Patent Office, 25 Southampton Buildings, London, W.C.2, from which copies may be obtained.

978604 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

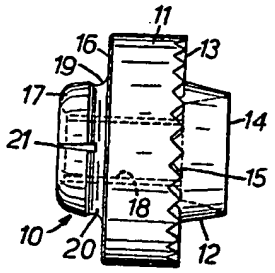

FIG. 1.

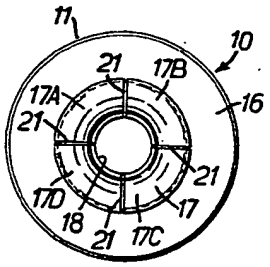

FIG. 2.